

PERSPECTIVES ON HIGH-TEMPERATURE  
SUPERCONDUCTING ELECTRONICS

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**ABSTRACT**

The major challenges in making HTSC electronics viable are predominantly materials problems. Unlike their predecessors, the metal oxide-based superconductors are integratable with other advanced technologies such as opto- and micro-electronics. The materials problems to be addressed relate to the epitaxial growth of high-quality films, highly oriented films on non-lattice-matched substrates, heterostructures with atomically sharp interfaces for junctions and other novel devices, and the processing of these films with negligible deterioration of the superconducting properties.

I illustrate these issues with results based on films prepared in situ by a pulsed laser deposition process. Films with zero-transition temperatures of 90 K and critical current densities of  $5 \times 10^6$  A/cm<sup>2</sup> at 77 K have been prepared by this technique. Ultra-thin films--less than 100 Å--show  $T_c > 80$  K, supporting the idea of two-dimensional transport in these materials. By the use of appropriate buffer layers, films with  $T_c$  of 87 K and  $J_c$  of  $6 \times 10^4$  A/cm<sup>2</sup> have been fabricated on silicon substrates. Submicron structures with  $J_c > 2 \times 10^7$  at 10 K have been fabricated.

Results on nonlinear switching elements, IR detectors and microwave studies will be briefly summarized.